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2957A

RADIO TEST SYSTEM for AMPS

MP MASTER
MA31144

Programming Manual

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Programming Manual

H 52957-901B
Vol. 1A

RADIO TEST SYSTEM

2957A

for AMPS

Part no. 52957-901B (with 2955)
52957-910U (with 2955A)
52957-321Z (with 2955R)

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ASSOCIATED PUBLICATIONS

Operating Manual (H 52957-901B Vol. 1)	Part no. 46881-980X
Service Manual (H 52957-901B Vol. 2)	Part no. 46881-982C

PREFACE

The Radio Test System 2957A consists of a Radio Communications Test Set 2955 series with a Cellular Adapter. The Cellular Adapter includes software for AMPS.

AMENDMENT STATUS

Each page bears the date of the original issue or the date and number of the latest amendment. Any changes subsequent to the latest amendment are included on Manual Change sheets coded C1, C2 etc.

WARNINGS AND CAUTIONS

See the Operating Manual.

Chapter 1

INTRODUCTION TO PROGRAMMING

PURPOSES OF PROGRAMMING

The programming capability of the 2957A can be used for two distinct applications as follows:-

(a) To operate the 2957A from a remote position. The test sequences and test routines can be those which are built-in or they can be defined by the user.

(b) To execute programs which have been written by the user.

In these programs, the user can define the following:-

(a) Test sequences - sequences of built-in and/or user-defined test routines.

(b) Test routines - routines as the built-in ones but with parameters changed.

(c) Screen displays.

(d) Printout formats.

The user's programs are retained in non-volatile memory and can be stored on and loaded from floppy discs.

METHODS OF REMOTE CONTROL

All the key-type controls on the 2957A function in the same way as a computer keyboard. When a key is pressed, the key's code is sent to the internal microprocessor. It follows that the keys' codes can be generated externally.

Similarly, as the 2957A's screen display is generated by the internal microprocessor, it follows that the display data can be passed to a printer.

As shown in Fig. 1-1, the three ways to remotely control an instrument are as follows:-

(a) From a GPIB controller, through a GPIB to the instrument's GPIB port.

(b) From a microcomputer which is fitted with a GPIB interface unit, through a GPIB to the instrument's GPIB port.

(c) From a microcomputer which is fitted with an RS-232 interface unit, through an RS-232 link to the instrument's serial port.

The GPIB system is suitable for connecting up to fifteen instruments on a maximum total bus length of 20 m. The maximum baud rate is 1 Mbits/s.

The RS-232 system is suitable for a direct link on a maximum length of 15 m. Modems can be inserted to use a telephone line or any other asynchronous system. The maximum baud rate is 9.6 kbits/s.

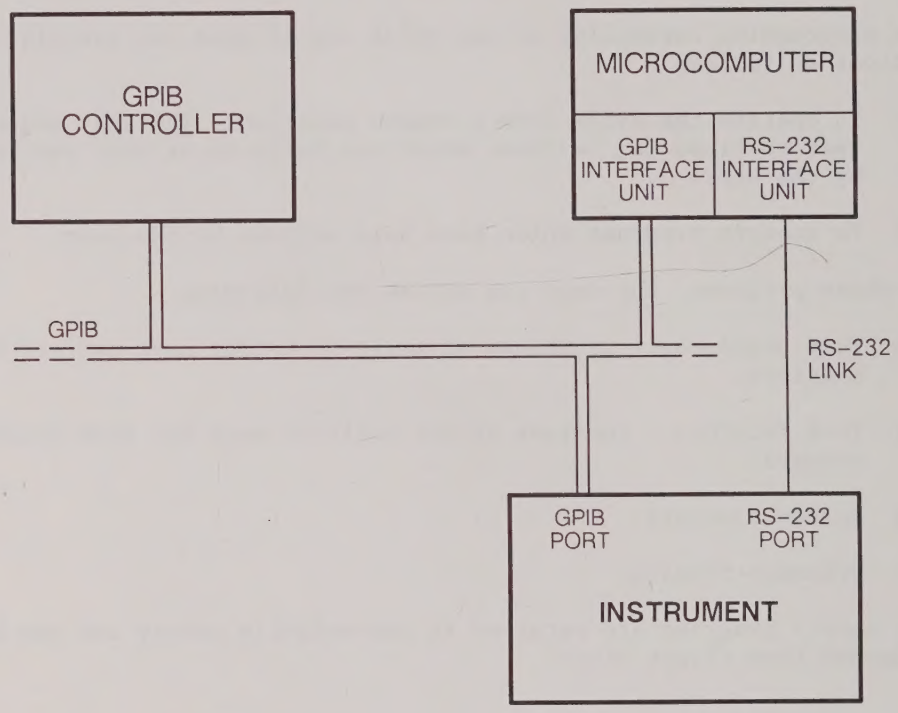

Fig. 1-1 Methods of remote control

RS-232 INTERFACE UNIT

When the unit has appropriate switches, it is necessary to set them to the COM port number and the IRQ number.

It is necessary to program the RS-232 interface for the required baud rate, parity, data bits and stop bits. This can be done under MS-DOS or in BASIC.

Port setting under MS-DOS

Enter the asynchronous communications mode as follows:-

MODE COM<m>:<baud>[,<parity>[,<databits>[,<stopbits>]]]

where m = COM port number,
baud = 110, 150, 300, 600, 1200, 2400, 4800 or 9600,
parity = N (none, O (odd) or E (even),
databits = 7 or 8,
stopbits = 1 or 2.

Port setting in BASIC

Open the communications channel as follows:-

```
OPEN "COM<m>:<baud>[,<parity>[,<databits>[,<stopbits>]]]"

where m        = COM port number,
      baud     = 110, 150, 300, 600, 1200, 2400, 4800 or 9600,
      parity   = N (none, O (odd) or E (even),
      databits = 7 or 8,
      stopbits = 1 or 2.
```

Setting the 2957A

Using the INTERFACE MENU, it is necessary to set the instrument for the required baud rate, parity, data bits and stop bits.

GPIB PROGRAMMING

For a GPIB controller, the appropriate commands are detailed in the appropriate Programming Manual Supplement.

For a microcomputer which has a GPIB interface unit, the same commands can be entered in a TBASIC program.

RS-232 PROGRAMMING IN BASIC

An instrument is controlled remotely by sending the appropriate commands to it. These are ASCII strings and are detailed in the appropriate Programming Manual Supplement. The commands are sent to the instrument by entering them as constants in a BASIC program. When the BASIC program has been entered, then it can be RUN.

PROGRAMMING MODES

There are three of these as follows:-

(a) Immediate mode. WAITING FOR RUN is displayed on the screen.

(b) Learn mode. IN LEARN MODE is displayed on the screen.

(c) User mode. IN USER MODE is displayed on the screen.

In immediate mode, the 2957A responds to each individual command as it is received.

In learn mode, the 2957A retains program statements for a user-defined test sequence.

In user mode, the 2957A retains program statements for a user-defined test subroutine.

Chapter 2

WRITING A PROGRAM

INTRODUCTION

In the remote CRTS immediate mode, the 2957A is controlled by means of commands on the GPIB or through the RS-232 port.

In the remote pass-through mode, the 2955 is controlled by means of commands on the GPIB or through the RS-232 port.

In the remote CRTS learn mode, the 2957A is controlled by means of statements in a program.

Each command or program statement consists of a command code, numerical data as appropriate, ASCII strings as appropriate and suitable delimiters. For convenience, spaces can be included between command codes and data but not within data. The syntax of commands and program statements is in seven forms. Full details of syntax forms are given on pages 2-2 to 2-4.

Command codes are mnemonics of English words and abbreviated English words. They can be entered as upper or lower case letters - the 2957A does not differentiate. To reduce the number of bytes used to store a program, most command codes are tokenized. Each token is a single byte above 7F hexadecimal (i.e. above the ASCII range). Full details of command codes are given in the Programming Manual Supplements.

Programming also allows the user to define his own parameters in test routines. Further information on this subject is given on pages 2-4 to 2-6.

Programming allows the user to define his own test sequences. Further information on this subject is given on pages 2-6 to 2-8.

Error messages are detailed on pages 2-8 and 2-9.

All ASCII strings have to be enclosed within single or double quotation marks except for the string following COMMAND. After COMMAND, the string is not enclosed in quotation marks unless they are also intended to be sent to the 2955.

SYNTAX

Conventions

The following are used in this manual:-

Notation	Explanation	Example
AAAAAAAA	Items which are entered as a string	END
AAAAaaaa	Minimum abbreviation in upper case and optional characters in lower case	SAve
<AAAAAA>	ASCII control code or keyboard function to be entered as a single key stroke	<SPACE>
<aaaaaa>	Information as described which is to be entered as a string	<integer>
<"aaaa">	Information as described which is to be entered as a string within quotation marks	<"text">
[ ]	Entry of the enclosed item is optional	[<LF>]
{ | }	The enclosed two (or more) items are alternatives	{<,>|<LF>}
...	The previous type of entry can be repeated as necessary	<integer> <,> ...

Delimiters

Every statement has to end with a delimiter or with another command code. There are three types of delimiter as follows:-

(1) High priority. Used to terminate command statements.

<LF> for linefeed, <ETX> for end of text or <ETB> for end of text block.

Where a high priority delimiter <LF> is shown, <ETX> or <ETB> can be used instead.

(2) Low priority. Used to give delimiting without a linefeed. Also used for the separation of separate fields within a command statement.

<,>, <SPACE>, <;> or <CR>.

Where a low priority delimiter <,> is shown, <SPACE>, <;> or <CR> can be used instead.

(3) Text. Single or double quotation marks for ASCII literal strings.

Syntax forms

There are seven forms of syntax as follows:-

(1) <command code> {<,>|<LF>}

Example: DEFAULT<,> (Set default parameters.)

(2) <command code> [<,>] <integer> {<,>|<LF>}

Example: TEST 28<LF> (Execute test routine no. 28.)

(3) <command code> [<,>] <integer> <,> ... <value> <,> ... <LF>

This syntax form has compulsory delimiters for separting adjacent numbers. There can be any number of separate integers and values.

Example: PARAMETER9,2,30W,5W<LF> (Set DC power parameters at 30 W and 5 W.)

(4) <command code> [<,>] [<integer> <,> <integer>] <,>
{<command code>|<"text">} {<,>|<LF>}

This syntax form applies to PRINT and WRITE only. There are two types of statement - one prints or displays immediately; the other does so at a defined set of co-ordinates. When the latter is required, the co-ordinates are entered as the two integers separated by a low priority delimiter. Then, there is another command code (e.g. ESN for the equipment serial number to be printed or displayed) or text.

Examples: (1) PRINT SEQTTL<,> (Print the current test sequence title.)

(2) WRITE 3,9,"WARNING"<LF> (Write WARNING at column 3, row 9.)

(5) <command code> [<,>] <integer> <,> <integer> {<,>|<LF>}

This form has two integers separated by a compulsory delimiter.

Example: JBC7,66 (Jump to LABEL 66 if bit 7 is clear.)

(6) <command code> <,> "text" <LF>

Example: SEQTTL "QUICK TEST"<LF> (Title of test sequence is QUICK TEST.)

(7) <COMMAND> [<,>] <statement> ... <LF>

This is only used with COMMAND. It causes the statement(s) between COMMAND and the high priority delimiter to be passed through to the 2955.

Example: COMMAND RGFR850.015MZ<LF> (Generated RF to be 850.015 MHz.)

Notes...

(1) Most statements can be concatenated into one data stream by using commas or spaces as delimiters. However, some of them require a terminating linefeed.

(2) All numbers have to be in decimal format unless otherwise stated.

(3) The maximum length of a string is 40 characters.

(4) In serial control mode, the 2957A inserts a linefeed whenever a carriage return is encountered.

COMMAND CODES

As there are slight differences between systems, the command codes are detailed in the Programming Manual Supplements.

Settings are retained in non-volatile memory until a new system option is selected except for CSL and SRQ. When a new system is selected, the default settings apply. CSL and SRQ settings are not retained but revert to 0 when the instrument is switched on.

TEST ROUTINE PARAMETERS

Guidance on changing the parameters of the test routines is given below. In the Programming Manual Supplements, details are given of the possible range and the default value of each parameter for each test routine.

For each test routine, there are from one to five parameters as described below.

Parameter 1

This controls, as appropriate, the following:-

(a) The type of test result required.

(b) Cellular radio or private mobile radio (PMR).

(c) Type of measurement - Distortion, SINAD, S/N or residual noise. In test routines no. 3 and no. 6, SINAD (Distortion) is a special case in which SINAD is measured but DISTORTION is shown on the screen.

(d) Type of filter - 15 kHz LP, 0.3 to 3.4 kHz, 300 Hz LP or psophometric.

(e) Setting of control port lines.

(f) RF power level settings.

(g) Actions at handoff.

(h) SAT transponding, deviation and frequency.

These are all controlled by 0 or 1 states of bits in a byte. The resulting binary number is converted to a decimal number for entry in a program.

The type of test result can be expressed in different ways as follows:-

(a) Reference value and maximum error (RV & ME). This is a reference value (RV) together with a maximum permissible error (ME) (i.e. the maximum ± difference from the RV). The RV and ME, UL or LL are set under parameters 2 and 3. The RV can be the current channel frequency (RV & ME (CC)).

(b) Upper limit and lower limit (UL & LL). These are the limits of the range in which the reading is to be.

Examples: (1) If it is required to test transmitter power (test routine no. 1) using upper and lower limits, bit 0 has to be set to a binary number of 00000001. Accordingly, the decimal value 1 is entered as parameter 1 for test routine no. 1.

(2) If it is required to test transmitter AF residual noise (test routine no. 3) using a 300 Hz low pass filter, bits 4 and 5 have to be set for the residual noise measurement to a binary number of 00110000 (decimal 48) and bit 3 has to be set for the filter to a binary number of 00001000 (decimal 8). Adding these together gives a binary number of 00111000 (decimal 56). Therefore, the decimal number 56 is entered as parameter 1 for test routine no. 3.

Parameter 2

This contains, depending on the test routine and the type of result which has been selected, one of the following:-

(a) Reference value and unit (RV).

(b) Value and unit for the upper limit (UL).

(c) Value and unit for the lower limit (LL).

Parameter 3

This contains, depending on the test routine and the type of result which has been selected, one of the following:-

(a) Value and unit for the maximum permissible error (ME).

(b) Value and unit for the lower limit (LL).

(c) Value used in special tests.

Notes...

(1) RV & ME. Providing the ME is in the same units as the RV, the created range for RV ± ME is checked against the given range (e.g. if 900 MHz is entered as the RV and 150 MHz is entered as the ME, the range created is 750 to 1050 MHz. As the given range is 0 to 1000 MHz, a parameter range error is indicated).

(2) UL & LL. Parameters 2 and 3 have to be in the same units.

Parameter 4

This contains the nominal modulation level and complies with the ranges 100 Hz to 25 kHz, 1 to 70% and 0.1 to 10 rads. An exception to this is test routine no. 28.

Parameters 4 and 5

In test routine no. 28 only, these are upper limit and lower limit as parameters 2 and 3. For NMT-450, parameters 2 and 3 are for power level 3; parameters 4 and 5 are for power levels 0, 1 and 2. For NMT-900, parameters 2 and 3 are for power levels 2 and 3; parameters 4 and 5 are for power levels 0 and 1.

Changing the parameters

Parameters are changed by means of a statement in a program. This consists of PARameter, the test routine number, the first parameter to be changed and the data for this and each subsequent parameter.

Example: PARAMETER 6,1,28,26dB,-80dBm, 2kHz<LF>

This begins (PARAMETER6) by specifying test routine no. 6 and then (1), parameter 1 is specified. The value and unit of parameters 1, 2, 3 and 4 (28, 26dB, -80dBm, 2kHz) are stated. This means a receiver SINAD measurement with the psophometric filter (16 + 12 = 28) with a lower limit of 26 dB and a reference modulation level of 2 kHz.

Note...

The number of the first parameter is always given so that a shortened form can be used starting with parameter 2, 3 or 4.

USER-DEFINED TEST SEQUENCES

Guidance on entering your program is given below. Sample programs are given in the Programming Manual Supplements. Also, the programs for the built-in test sequences are given so that these can be used as the basis for your own programs.

Entering a program

Enter your program as follows:-

(1) Connect the programming device to either the GPIB port or the RS-232 port.

(2) After switch-on, press the CRTS key to enter local CRTS mode. Wait until initializing and self-testing have finished.

(3) Send the appropriate remote command from the programming device. Using a GPIB controller with a 2957A which has been set to GPIB address 06, send REMOTE 706. For RS-232 operation, send <CR>.

(4) The 2957A enters the FULL AUTO TEST mode and displays WAITING FOR RUN. For RS-232 operation, it is useful to send ECHO 1 so that each character is echoed back to the terminal.

(5) Allocate a title to the user-defined test sequence. Send SEQTTL followed by, enclosed in quotation marks, the title of up to 22 characters.

(6) Send LEARN to enter the learn mode. WAITING FOR RUN is replaced by IN LEARN MODE.

(7) Now, enter the main body of your program. Guidance on writing this is given below.

(8) Terminate the program by sending END. The user-defined test sequence is now in memory. WAITING FOR RUN is redisplayed.

(9) To select the user-defined test sequence, send TSI4. Using a typical GPIB controller, send OUTPUT 706;"TSI 4". This causes the display to change to the user-defined test sequence.

(10) Prior to running the program, it is worth saving the program on disc in case it is later overwritten. If this happens, the program does not then need to be re-entered but merely reloaded from disc. The displayed starting parameters should be correctly set up before saving since both the user-defined program area and the non-volatile variables are recovered with the disc file.

(11) To run the user-defined test sequence, send RUN. This is equivalent to START TEST in 2955 local mode.

(12) The user-defined test sequence is now executed. If there is an error in the program, an ERROR message is displayed. See 'Error messages' on page 3-2-40. The error has to be corrected and the program reloaded before re-running. For a non-recoverable error (e.g. the program in a continuous loop), it is necessary to switch off and start again. If required during a run, the test sequence can be aborted by sending the ESCape character CHR$(27).

Program construction

A modular programming technique should be used. In this, the main routine is used as follows to display the title of the test sequence, request operator interaction and display the measurement results.

Subroutines are used to perform the actual measurements or other actions. This allows the main routine to be defined without regard to the details of making the measurements etc. It also allows each subroutine to be changed without affecting either the main routine or the other subroutines.

To pass program flow from the main routine to a subroutine, GOSUB is used. To return to the main routine, RETURN is used. Subroutines can be nested to a depth of six levels. When this number is exceeded, a warning message is given. Each subroutine is identified by its LABEL which is uniquely numbered.

The default parameters for the built-in test routines (i.e. following DEFAULT) can be modified in user-defined test sequences.

Example: WRITE 3,29 SEQTTL GOSUB 60 WRITE 23,29,RESULT JUMP 61 <CR><LF>
LABEL 60 TEST 21 RETURN <CR><LF>
LABEL 61 END <CR><LF>

This begins (WRITE 3,29 SEQTTL) by writing the previously allocated title of the test sequence on the screen at column 3, row 29. It then goes (GOSUB 60) to the subroutine which is identified by LABEL 60. This subroutine (TEST 21) causes test routine no. 21 (call placement from to mobile) to be performed. After this, program flow is returned to the main routine (WRITE 23,29,RESULT). The result is written on the screen at column 23, row 29. Finally, the program makes an unconditional jump (JUMP 61) to LABEL 61. This terminates the program.

Notes...

(1) In the example, the screen row which was chosen is far enough down the screen not to intrude on the normal test display area.

(2) In the example, the three program lines could have been run together but, due to the restriction of the 80 character buffer, it is better practice to use high priority delimiters between quite small sections of program.

(3) In the example, the JUMP 61 was used in the program in order to jump around the subroutine to the END command.

(4) It is recommended that, following an unattended initializing and self-testing, RD56 is sent to read any error code and, after a disc operation, RD57 is sent to read any error code.

ERROR MESSAGES

The following messages are displayed when errors are found in user-defined test sequences:-

Error message	Meaning
ERROR: PARAMETERS FLAG	Illegal bit combination in parameter 1.
ERROR: xxxxxxxx FILTER	Illegal filter bits in parameter 1.
ERROR: PARAMETERS UNITS	Invalid units for one or more parameters.
ERROR: PARAMETERS RANGE	Parameters outside permitted range.
ERROR: NOT IMPLEMENTED	Test routines no. 10 to no. 19 not yet in use.
ERROR: ZERO REFERENCE	For a reference and maximum error type result, the reference cannot be zero unless the maximum error is in the same units as the reference.
ERROR: NO DC POWER	Avoids wasting time re-testing if failed already.

If a parameter is too large or too small, an acceptable value is shown with a > sign or a < sign (e.g. >9.99 or <0.01). This can also show when the user has not understood the syntax of parameter since the display shows the 2957A's interpretation of the parameters.

During the DC power test, the DC voltage and current are also shown. The parameters and DC readings are only shown when the display format is FULL. When the display format is SUMMARY, only the single line giving the test routine title, status and result is displayed.

When the type of test result in parameter 1 is the reference value and the maximum error (RME), the 2957A checks that the maximum error is in units which are compatible with the reference units for purposes of calculation. Compatible units, together with whether the result is a ratio (R) or a difference (D), are as follows:-

Maximum error unit	Reference unit												
	None	V	Hz	A	W	s	dB	dBm	dBV	dBW	rad	ppm	%
None	D	-	-	-	-	-	-	-	-	-	-	-	-
V	-	D	-	-	-	-	-	-	-	-	-	-	-
Hz	-	-	D	-	-	-	-	-	-	-	-	-	-
A	-	-	-	D	-	-	-	-	-	-	-	-	-
W	-	-	-	-	D	-	-	-	-	-	-	-	-
s	-	-	-	-	-	D	-	-	-	-	-	-	-
dB	-	R	-	R	R	-	D	D	D	D	-	-	-
rad	-	-	-	-	-	-	-	-	-	-	D	-	-
ppm	R	R	R	R	R	R	-	-	-	-	R	D	-
%	R	R	R	R	R	R	-	-	-	-	R	-	D

Transmitter RF distortion and transmitter modulation limiting test routines attempt to set the transmitter carrier to a reference modulation level deviation by varying the AF generator output. NO MODULATION or READING UNSTABLE is shown when the 2957A is unable to set the reference modulation level.

Chapter 3

COMMAND CODES

INTRODUCTION TO COMMAND CODES FOR THE IMMEDIATE MODE

A test sequence can be run by using the following:-

Command code	Function	Syntax form	Data format
LOAd	Load a file from disc	2	1 digit
RUn	Run test sequence	1	-
TSi	Select test sequence	2	1 digit

The details of a test sequence can be displayed or printed by using the following:-

Command code	Function	Syntax form	Data format
CSl	Enable/disable continuous summary lines	2	1 digit
DFi	Set display format	2	1 digit
PRInt	Print to current printer port	4	2 & 2 digits & text/code
PRO	Set criteria for printing result of test routine	2	1 digit
SEqttl	Set title of user-defined test sequence	6	Text
WRite	Write to 2955 screen at x, y	4	2 & 2 digits & text/code

Communications parameters can be set by using the following:-

Command code	Function	Syntax form	Data format
BRi	Set baud rate for RS-232 port	2	1 digit
DSi	Set disc step rate	2	1 digit
ECho	Enable/disable RS-232 echo	2	1 digit
LPi	Set data length and parity of serial port	2	1 digit
PPi	Select printer port	2	1 digit
PTi	Select printer terminator	2	1 digit
PUrge	Clear RS-232 or GPIB buffer	1	-
SBi	Set number of stop bits	2	1 digit
SRq	Enable/disable service request	2	1 digit

Various test conditions can be set by using the following:-

Command code	Function	Syntax form	Data format
CCH	Set current control channel	2	4 digits
CCi	Set default control channel	2	4 digits
DEfault	Load default parameter data, execute any user-defined subroutine	1	-
Fvc	Set first voice channel	2	4 digits
HInc	Set handoff increment	2	4 digits
LVc	Set last voice channel	2	4 digits
PMi	Set pause mode	2	1 digit
VCh	Set current voice channel	2	4 digits

Various settings can be made and the settings can be read by using the following:-

Command code	Function	Syntax form	Data format
DCc	Set digital colour code	2	1 digit
	Read digital colour code	1	-
DTmf	Enable/disable DTMF test	2	1 digit
	Read DTMF test setting	1	-
HF	Enable/disable hook flash test	2	1 digit
	Read hook flash test setting	1	-
Min	Set mobile identity number	6	Number
	Read MIN	1	-
NFI	Set number format	2	1 digit
	Read number format setting	1	-
SCc	Set SAT colour code	2	1 digit
	Read SAT colour code setting	1	-
SId	Set system identity number	6	5 digits
	Read system identity number	1	-

Various readings can be made by using the following:-

Command code	Function	Syntax form	Data format
ESn	Read equipment serial number	1	-
RD	Request a reading	2	3 digits
VMother	Read version of motherboard software	1	-
VPers	Read version of personality board software	1	-

Under the supervision of a Marconi Instruments representative, the memory can be read and set by using the following:-

Command code	Function	Syntax form	Data format
PEI	Peek I/O address and place contents in flag register	2	3 digits
PEM	Peek memory address and place contents in flag register	2	5 digits
POI	Poke I/O port with data	5	3 & 3 digits
POM	Poke memory with data	5	5 & 3 digits

The mode can be changed by using the following:-

Command code	Function	Syntax form	Data format
CRTS	Change to CRTS mode	1	-
LEarn	Enter learn mode	1	-
LOCal	Go to local control mode from RS-232	1	-
NOrmal	Go to normal 2955 mode	1	-
USer	Enter user mode	1	-

Other operations can be carried out by using the following:-

Command code	Function	Syntax form	Data format
COMmand	Control 2955 directly in CRTS mode	7	-
CONtinue	Continue after pause	1	-
PAUse	Pause at end of current test routine	1	-
RECall	Recall settings	2	1 digit
SAve	Save current user-program on disc	2	1 digit
STOre	Store setting	2	1 digit
UPI	Read user port input lines	1	-
UPO	Set user port output lines	2	3 digits

INTRODUCTION TO COMMAND CODES FOR THE LEARN MODE AND THE USER MODE

A test routine can be programmed by using the following:-

Command code	Function	Syntax form	Data format
TEst	Execute following test routine	2	2 digits

The details of a test routine can be displayed or printed by using the following:-

Command code	Function	Syntax form	Data format
DFi	Set display format	2	1 digit
PRInt	Print to current printer port	4	2 & 2 digits & text/code
PRO	Set criteria for printing result of test routine	2	1 digit
WRite	Write to 2955 screen at x, y	4	2 & 2 digits & text/code

To display or print the details of a test routine, PRINT or WRITE precedes the following:-

Command code	Function	Syntax form	Data format
BUffer	Print printer array buffer	4	-
CLear	Clear printer array buffer	4	-
DIsable	Disable printing	4	-
ENAble	Enable printing	4	-
ESn	Print or write ESN	4	-
Indicator	Print or write test status indicator	4	-
LIne	Print first line of printer array buffer	4	-
Min	Print or write MIN	4	-
RESult	Print or write test routine result	4	-
SEqttl	Print or write test sequence title	4	-
STAtus	Print or write test routine status	4	-
SUMmary	Print or write test routine summary	4	-
TITle	Print or write current test routine title	4	-

Communications parameters can be set by using the following:-

Command code	Function	Syntax form	Data format
BRi	Set baud rate for RS-232 port	2	1 digit
PPi	Select printer port	2	1 digit
PTi	Select printer terminator	2	1 digit

Various test conditions can be set by using the following:-

Command code	Function	Syntax form	Data format
Aid	Set area identity number	6	5 digits
CCH	Set current control channel	2	4 digits
CCi	Set default control channel	2	4 digits
CRI	Set charge rate	2	4 digits
DCc	Set digital colour code	2	1 digit
DTmf	Enable/disable DTMF test	2	1 digit
Fvc	Set first voice channel	2	4 digits
HF	Enable/disable hook flash test	2	1 digit
HInc	Set handoff increment	2	4 digits
LVc	Set last voice channel	2	4 digits
NFI	Set number format	2	1 digit
PARameter	Set test routine parameters	3	2 & 1 digits & text
PMi	Set pause mode	2	1 digit
SCc	Set SAT colour code	2	1 digit
VCh	Set current voice channel	2	4 digits

In learn mode only, the loading of default parameter data and the executing of any user-defined subroutine can be invoked by using the following:-

Command code	Function	Syntax form	Data format
DEfault	Load default parameter data, execute any user-defined subroutine	1	-

Subroutines and alternative paths can be entered by using the following:-

Command code	Function	Syntax form	Data format
Gosub	Call subroutine at given label	2	3 digits
JBC	Jump to label if designated bit is clear	5	1 & 3 digits
JBS	Jump to label if designated bit is set	5	1 & 3 digits
JEq	Jump to label if value is equal to flag register	5	3 & 3 digits
JNe	Jump to label if value is not equal to flag register	5	3 & 3 digits
JOE	Jump to label on test error	2	3 digits
JOF	Jump to label on test failure	2	3 digits
JOP	Jump to label on test pass	2	3 digits
JUmp	Jump to label unconditionally	2	3 digits
LAbel	Marker for position in program	2	-
RETurn	Return from subroutine	1	-

Repetitions and loops can be invoked by using the following:-

Command code	Function	Syntax form	Data format
NExt	Next pass of repeat loop	1	-
NXtch	Next channel and next RPTCH loop	1	-
REPeat	Repeat a loop	2	3 digits
RPtch	Repeat loop from current to last voice channel	1	-
STPch	Step to next voice channel	1	-

Under the supervision of a Marconi Instruments representative, the memory can be read and set by using the following:-

Command code	Function	Syntax form	Data format
PEI	Peek I/O address and place contents in flag register	2	3 digits
PEM	Peek memory address and place contents in flag register	2	5 digits
POI	Poke I/O port with data	5	3 & 3 digits
POM	Poke memory with data	5	5 & 3 digits

The exit from the learn mode or from the user mode is made by using the following:-

Command code	Function	Syntax form	Data format
END	End of program or user-defined subroutine, return to immediate mode	1	-

Other operations can be carried out by using the following:-

Command code	Function	Syntax form	Data format
COMmand	Control 2955 directly in CRTS mode	7	Text
Key	Wait for keypress and store value in flag register	1	-
WAit	Wait for n milliseconds	2	5 digits

DETAILS OF COMMAND CODES

Notes...

(1) The appropriate command codes are detailed below and summarized in Appendix 1. Information which is applicable to the learn mode is also applicable to the user mode except where otherwise stated.

(2) For the format, the number of digits is the maximum.

(3) In the examples, the information within parentheses is explanatory and should not be entered and does not appear on the screen.

(4) With a 2957A, it is not possible to use programs which have been saved on disc from a 2957.

(5) A 2957A can be configured to use the same RD numbers as for the 2957. See the SYSTEM CONFIGURATION option under the MISCELLANEOUS MENU in the Operating Manual.

BRi (Baud Rate Is)

Function: Set baud rate for RS-232 port. The default number is 7.
Token: 96.
Format: BRI or BR, followed by a 1-digit number:
0 = 75 bauds, 1 = 150 bauds, 2 = 300 bauds, 3 = 600 bauds,
4 = 1200 bauds, 5 = 2400 bauds, 6 = 4800 bauds, 7 = 9600 bauds.
Example: BR 6 (Set the baud rate to 4800 bauds).
Modes: Immediate and learn.
Errors: Syntax (Out of range, baud rate number is not 0 to 7).

BUffer

Function: Argument for PRINT, print printer array/buffer.
Token: E3.
Format: BUFFER or BU, immediately preceded by PRINT.
Modes: Learn only.

CCH (Control CHannel)

Function: Set current control channel.
Token: 8F.
Format: CCH followed by a 4-digit number.
Example: CCH 43 (Set the current control channel to 43).
Modes: Immediate and learn.
Errors: Syntax (Out of range, control channel number is not within minimum and maximum).

CCi (Control Channel Is)

Function: Set default control channel. The default number is 334. This only affects the data in the menus and not the current control channel. See CCH.
Token: 8E.
Format: CCI or CC, followed by a 4-digit number.
Example: CC 140 (Set the default control channel to 140).
Modes: Immediate and learn.
Errors: Syntax (Out of range, control channel number is not within minimum and maximum).

CLear

Function: Argument for PRINT, clear printer array/buffer.
Token: E2.
Format: CLEAR or CL, immediately preceded by PRINT.
Use: Fills the printer array/buffer with all spaces.
Modes: Learn only.

COMmand

Function: Control 2955 directly in CRTS modes.
Token: 9B.
Format: COMMAND or COM, followed by string of up to 40 characters terminated with <LF>.
Use: Passes a command code string, without checking, directly to the 2955.
Example: COM RX,RG,FR123.5MZ<LF> (Set the 2955 to the RECEIVER TEST mode with an RF generator frequency of 123.5 MHz).
Modes: Immediate and learn.

CONtinue

Function: Continue after pause.
Format: CONTINUE or CON, alone.
Use: Continues a test sequence following a PAUSE command.
Modes: Immediate only.

CRTS

Function: Change to CRTS modes from pass-through mode.
Format: CRTS alone.
Use: Transfers operation from 2955 to CRTS.
Modes: Immediate only.

CSl (Continuous Summary Lines enable/disable)

Function: Enable/disable output of summary line after a test routine. The default number is 0.
Format: CSL or CS, followed by a 1-digit number: 0 = disable, 1 = enable.
Use: Passes the last summary line to the GPIB port or the RS-232 port.
Example: CS 1 (Enable output of summary lines).
Modes: Immediate only.

DCc (Digital Colour Code)

Function: Set digital colour code. The default number is 0.
Token: DD.
Format: DCC or DC, followed by a 1-digit number:
0 = 00, 1 = 01, 2 = 10, 3 = 11.
Example: DC 2 (Set the digital colour code to 10).
Modes: Immediate and learn.
Errors: Syntax (Out of range, digital colour code number is not 0 to 3).

Function: Read digital colour code setting.
Format: DCC or DC, alone.
Use: To pass the digital colour code setting to other equipment.
Modes: Immediate only.

DEfault

Function: Load default data for following test routines. Also, the 2957A executes any user-defined test subroutine which has been entered under USER.
Token: 82.
Format: DEFAULT or DE, alone.
Modes: Immediate and learn.
Errors: Syntax.

DFi (Display Format Is)

Function: Set display format. The default number is 1. The display format cannot be changed during a test sequence.
Token: 94.
Format: DFI or DF, followed by a 1-digit number: 0 = summary, 1 = full.
Use: Sets the display format for FULL AUTO TEST mode. In the GO/NO-GO TEST mode, the display format is always summary.
Example: DF 0 (Set the default display format to summary).
Modes: Immediate and learn.
Errors: Syntax (Out of range, display format number is not 0 or 1).

DIsable

Function: Argument for PRINT, disable printing.
Token: E0.
Format: DISABLE or DI, immediately preceded by PRINT.
Use: Causes all printing to be disabled. Followed by PRINT ENABLE to re-enable printing.
Modes: Learn only.

DSi (Disc Step rate Is)

Function: Set disc step rate. The default number is 0.
Format: DSI or DS, followed by a 1-digit number: 0 = 6 ms, 1 = 12 ms.
Use: Selects for different types of disc drive.
Example: DS 1 (Select 12 ms step rate).
Modes: Immediate only.

DTmf (DTMF enable/disable)

Function: Enable/disable DTMF tones test routine. The default number is 0.
Token: DB.
Format: DTMF or DT, followed by a 1-digit number: 0 = disable, 1 = enable.
Example: DT 1 (Enable the DTMF tones test).
Modes: Immediate and learn.
Errors: Syntax (Out of range, DTMF number is not 0 or 1).

Function: Read DTMF tones test setting.
Format: DTMF or DT, alone.
Use: To pass the DTMF tones test setting to other equipment.
Modes: Immediate only.

ECho (ECHO enable/disable)

Function: Enable/disable RS-232 echo. The default number is 0.
Format: ECHO or EC, followed by a 1-digit number: 0 = off, 1 = on.
Example: EC 1 (Enable the RS-232 echo).
Modes: Immediate only.

ENAble

Function: Argument for PRINT, enable printing.
Token: E1.
Format: ENABLE or ENA, immediately preceded by PRINT.
Use: Re-enables printing which has been halted by PRINT DISABLE.
Modes: Learn only.

END

Function: End of program or user-defined subroutine. The 2957A then returns to the immediate mode.
Token: FF.
Format: END alone.
Use: Used at the end of a program to enable exit from learn mode.
Modes: Learn only.

ESn (Equipment Serial Number)

Function: Read equipment serial number. The default entry consists of fifteen full stops.
Format: ESN or ES, alone.
Use: To pass the number of the unit under test to other equipment.
Example: ES (Send the equipment's serial number from the GPIB port or the RS-232 port).
Modes: Immediate only.

Function: Argument for PRINT or WRITE, print or write equipment serial number.
Token: F1.
Format: ESN or ES, preceded by either PRINT or WRITE.
Use: When preceded by PRINT, the ESN is sent to the printer port; when preceded by WRITE, the ESN is written on the screen.
Example: WR 3,9,ES (Write the mobile's equipment serial number on the screen at column 3, row 9).
Modes: Learn only.

Fvc (First Voice Channel)

Function: Set first voice channel. The default number is 1.
Token: 91.
Format: FVC or F, followed by a 4-digit number.
Example: F 50 (Set the default first voice channel to 50).
Modes: Immediate and learn.
Errors: Syntax (Out of range, voice channel number is not within minimum and maximum).

Gosub

Function: Call subroutine at given label.
Token: 89.
Format: GOSUB or G, followed by a 3-digit label number in the range 0 to 255.
Use: Temporarily transfers the program flow to the named destination. Subroutines can be nested to a depth of six. Followed by RETURN to resume the main program.
Example: G 30 (Transfer the program flow temporarily to LABEL 30).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

HF (Hook Flash enable/disable)

Function: Enable/disable hook flash test routine. The default number is 0.
Token: DA.
Format: HF followed by a 1-digit number: 0 = disable, 1 = enable.
Example: HF 1 (Enable the hook flash test routine).
Modes: Immediate and learn.
Errors: Syntax (Out of range, hook flash number is not 0 or 1).

Function: Read hook flash test setting.
Format: HF alone.
Use: To pass the hook flash test setting to other equipment.
Modes: Immediate only.

HInc (Handoff INCrement)

Function: Set default handoff increment. The default number is 333.
Token: 93.
Format: HINC or HI, followed by a 3-digit handoff increment in the range 1 to 180.
Example: HI 33 (Set the handoff increment to 33).
Modes: Immediate and learn.
Errors: Syntax (Out of range, maximum increment number is exceeded).

Indicator

Function: Argument for PRINT or WRITE, print or write test status indicator.
Token: EE.
Format: INDICATOR or I, preceded by either PRINT or WRITE.
Use: When preceded by PRINT, the status indicator (-, F or E) is sent to the printer port; when preceded by WRITE, it is written on the screen.
Example: WR 3,9,I (Write the status indicator for the last test routine on the screen at column 3, row 9.)
Modes: Learn only.

JBC (Jump if Bit Clear)

Function: Jump to label if designated bit in flag register is clear.
Token: A4.
Format: JBC followed by a flag register bit number and a label number.
Use: If the numbered bit is logical 0, the program continues from the numbered label. The 8-bit flag register can contain the value for a key, the contents of a memory location or I/O port data.
Example: JBC 2,30 (If bit 2 is clear, jump to LABEL 30).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JBS (Jump if Bit Set)

Function: Jump to label if designated bit in flag register is set.
Token: A5.
Format: JBS followed by a flag register bit number and a label number.
Use: If the numbered bit is logical 1, the program continues from the numbered label. The 8-bit flag register can contain the value for a key, the contents of a memory location or I/O port data.
Example: JBS 2,30 (If bit 2 is set, jump to LABEL 30).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JEq (Jump if EQual)

Function: Jump to label if first value is equal to contents of flag register.
Token: A6.
Format: JEQ or JE, followed by a 3-digit decimal number and a label number.
Use: If the contents of the flag register is equal to the decimal value given, the program continues from the numbered label. The 8-bit flag register can contain the value for a key, the contents of a memory location or I/O port data.
Example: JE 255,30 (If the contents of the flag register equal 255, jump to LABEL 30).
Modes: Learn only.

JNe (Jump if Not Equal)

Function: Jump to label if first value is not equal to contents of flag register.
Token: A7.
Format: JNE or JN, followed by a 3-digit decimal number and a label number.
Use: If the contents of the flag register is not equal to the decimal value given, the program continues from the numbered label. The 8-bit flag register can contain the value for a key, the contents of a memory location or I/O port data.
Example: JN 255,30 (If the contents of the flag register are not equal to 255, jump to LABEL 30).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JOE (Jump On Error)

Function: Jump to label on test routine error.
Token: A2.
Format: JOE followed by a label number.
Use: If an error occurs during the preceding test routine, the program continues from the numbered label.
Example: JOE 90 (If there is an error during the preceding test routine, jump to LABEL 90).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JOF (Jump On Failure)

Function: Jump to label on test routine failure.
Token: A3.
Format: JOF followed by a label number.
Use: If there is a failure in the preceding test routine, the program continues from the numbered label.
Example: JOF 99 (If the preceding test routine fails, jump to LABEL 99).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JOP (Jump On Pass)

Function: Jump to label on test routine pass.
Token: A1.
Format: JOP followed by a label number.
Use: If there is a pass in the preceding test routine, the program continues from the numbered label.
Example: JOP 99 (If the preceding test routine passes, jump to LABEL 99).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JUmp

Function: Jump to label unconditionally.
Token: 86.
Format: JUMP or JU, followed by a label number.
Use: The program continues from the numbered label.
Example: JU 21 (Continue program execution from LABEL 21).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

Key

Function: Wait for keypress and store value in flag register.
Token: 9A.
Format: KEY or K, alone.
Use: Causes the program to wait until a key is pressed. The key code is then stored in the flag register for later testing. The values stored are as follows:-
0 = 2955, 1 = CRTS, 2 = DISC, 3 = PSOPH,
4 = TX, 5 = RX, 6 = DUPLEX, 7 = TONES,
8 = BAR CHART, blank or TX MON ON-OFF,
9 = SCOPE or SCOPE/BAR, 10 = HOLD DISPLAY, 11 = HELP.
Modes: Learn only.

LAbel

Function: Marker for position in program.
Token: 85.
Format: LABEL or LA, followed by a 3-digit number in the range 1 to 255.
Use: Provides a destination address for a GOSUB or JUMP.
Example: LA 30 (Identity of the following program subroutine).
Modes: Learn only.
Errors: Syntax.

LEarn

Function: Enter learn mode to define a subroutine. The 2957A cannot then respond to immediate mode commands until END is received. See USER for user mode.
Format: LEARN or LE, alone.
Use: Precedes the first command in a user-defined program in order to enter learn mode.
Modes: Immediate only.

LIne

Function: Argument for PRINT, print first line of printer array/buffer.
Token: E4.
Format: LINE or LI, immediately preceded by PRINT.
Modes: Learn only.

LOAd

Function: Load a file from disc. See Note (4) on page 3-1.
Format: LOAD or LOA, followed by a 1-digit file number.
Use: Loads a file from disc into the user-defined program area. File number range is 0 to 9.
Modes: Immediate only.

LOCal

Function: Go to local CRTS mode from RS-232.
Format: LOCAL or LOC, alone.
Use: Returns from RS-232 control to local control. For the GPIB, GTL or REN is used instead.
Modes: Immediate only.

LPi (Length and Parity Is)

Function: Set data length and parity of serial port. The default number is 5.
Format: LPI or LP, followed by 1-digit number: 0 = 7 even, 1 = 7 odd, 2 = 7 none, 3 = 8 even, 4 = 8 odd, 5 = 8 none.
Example: LP 5 (8 bits of data, no parity for serial port).
Modes: Immediate only.

LVc (Last Voice Channel)

Function: Set last voice channel. The default number is 666.
Token: 92.
Format: LVC or LV, followed by a 4-digit number.
Example: LV 180 (Set the default last voice channel to 180).
Modes: Immediate and learn.
Errors: Syntax (Out of range, voice channel number is not within minimum and maximum).

Min (Mobile Identity Number)

Function: Set mobile identity number.
Format: MIN or M, followed by, within quotation marks, the mobile's telephone number in the form xxx-xxx-xxxx.
Example: M "123-456-7890" (My identity number is 123-456-7890).
Modes: Immediate only.

Function: Read mobile identity number. The default number is 000-000-0000.
Format: MIN or M, alone.
Use: To pass the number of the unit under test to other equipment.
Example: MIN (Send the mobile's identity number from the GPIB port or the RS-232 port).
Modes: Immediate only.

Function: Argument for PRINT or WRITE, print or write mobile identity number. The default number is 000-000-0000.
Token: F0.
Format: MIN or M, followed by either PRINT or WRITE.
Use: When preceded by PRINT, the MIN is sent to the printer port; when preceded by WRITE, the MIN is written on the screen.
Example: WR 3,9,M (Write the mobile's identity number on the screen at column 3, row 9).
Modes: Learn only.

NExt

Function: Next pass of repeat loop.
Token: 88.
Format: NEXT or NE, alone.
Use: NEXT follows REPEAT to initiate another loop.
Example:
```
REPEAT 2
TEST 21
NEXT     (Make 2 attempts at placing call to mobile).
```
Modes: Learn only.
Errors: Syntax.

NFI (Number Format Is)

Function: Set number format. The default number is 3.
Token: D9.
Format: NFI followed by 1-digit number:
0 = decimal, 1 = hexadecimal, 2 = octal, 3 = standard.
Use: Selects the number format for printing or screen display.
Example: NFI 1 (Format the numbers in hexadecimal).
Modes: Immediate and learn.
Errors: Syntax (Out of range, format number is not 0 to 3).

Function: Read number format setting.
Format: NFI alone.
Use: To pass the number format setting to other equipment.
Modes: Immediate only.

NOrmal

Function: Go to normal 2955 mode.
Format: NORMAL or NO, alone.
Use: Returns from remote CRTS mode to remote pass-through mode. To return to remote CRTS mode, use CRTS.
Modes: Immediate only.

NXtch (NeXT CHannel)

Function: Next voice channel and next RPTCH loop.
Token: 8D.
Format: NXTCH or NX, alone.
Use: NXTCH follows RPTCH to initiate another loop.
Example: RPTCH
TEST 23
TEST 6
NXTCH (Measure receiver distortion in the current to the last voice channels).
Modes: Learn only.

PARameter

Function: Set test routine parameters.
Token: 81.
Format: PARAMETER or PAR, followed by a 2-digit test routine number in the range 1 to 9, 20 to 25 or 27 to 34, then a 1-digit parameter number in the range range 1 to 4 and then data.
Example: PAR 6,1,28,26dB,-80dBm,2kHz (Set parameters for test routine no. 6 SINAD measurement, using a psophometric filter, with lower limit 26 dB, RF generator level -80 dBm and reference modulation level 2 kHz).
Modes: Learn only.
Errors: Syntax (Less than 3 fields found or fields contain non-ASCII codes).

PAUse

Function: Pause at end of current test routine.
Format: PAUSE or PAU, alone.
Modes: Immediate only.

PEI (PEek I/O port)

Function: Peek I/O address and place contents in flag register. This should not be used except under the supervision of a Marconi Instruments representative.
Token: 9D.
Format: PEI followed by a 3-digit port address (range 0 to 255).
Use: Reads the contents of the designated I/O address and places the value in the 8-bit flag register for later testing.
Example: PEI 96 (Peek I/O address 96 and place the contents in the flag register.)
Modes: Immediate and learn.
Errors: Syntax.

PEM (PEek Memory)

Function: Peek memory address and place contents in flag register. This should not be used except under the supervision of a Marconi Instruments representative.
Token: 9E.
Format: PEM followed by a 5-digit memory address (range 0 to 65535).
Use: Reads the contents of the designated memory address and places the value in the 8-bit flag register for later testing.
Example: PEM 56320 (Peek memory address 56320 and place the contents in the flag register).
Modes: Immediate and learn.
Errors: Syntax.

PMi (Pause Mode Is)

Function: Set pause option. This cannot be changed during a test sequence.
Token: 95.
Format: PMI or PM, followed by a number: 0 = manual only, 1 = on failure, 2 = always.
Use: Selects the method of pausing after a test routine when in FULL AUTO TEST mode. In GO/NO-GO TEST mode, the pause is always manual only.
Example: PM 0 (Set the pause to manual only).
Modes: Immediate and learn.
Errors: Syntax (Out of range, pause mode number is not 0 to 2).

POI (POke I/O port)

Function: Poke I/O port with data. This should not be used except under the supervision of a Marconi Instruments representative.
Token: 9F.
Format: POI followed by a 3-digit port address and a 3-digit number in the range 0 to 255.
Example: POI 96,255 (Poke I/O address 96 with 255).
Modes: Immediate and learn.
Errors: Syntax.

POM (POke Memory)

Function: Poke memory address with data. This should not be used except under the supervision of a Marconi Instruments representative.
Token: A0.
Format: POM followed by a 5-digit memory address in the range 0 to 65536 and a 3-digit number in the range 0 to 255.
Example: POM 56320,255 (Poke memory address 56320 with 255).
Modes: Immediate and learn.
Errors: Syntax.

PPi (Printer Port Is)

Function: Select printer port. The default number is 0.
Token: 97.
Format: PPI or PP, followed by a 1-digit number:
0 = unassigned, 1 = GPIB talk only, 2 = serial, 3 = parallel.
Example: PP 3 (Select the parallel printer port).
Modes: Immediate and learn.
Errors: Syntax (Out of range, printer port number is not 0 to 3).

PRInt

Function: Print to current printer port.
Token: 83.
Formats: PRINT followed by a message within quotation marks.
PRINT followed by a command code.
PRINT followed by 2-digit x and y co-ordinates and then a message within quotation marks.
PRINT followed by 2-digit x and y co-ordinates and then a command code.
Uses: Prints either directly to the printer port or inserted into a 10-row (0 to 9) by 80-column (0 to 79) array at the specified co-ordinates. The top left of the screen is 0,0.
Examples
1: PRI "WARNING" (Print WARNING on printer).
2: PRI 3,9,RESULT (Print the measurement result on the printer at column 3, row 9).
Modes: Immediate and learn (when quotation marks are used) or learn only (when a command code is used).
Errors: Syntax.

PRO (PRint On)

Function: Set criterion for printing result of test routine. The default number is 0.
Token: 99.
Format: PRO followed by a 1-digit number:
0 = off, 1 = all, 2 = fail, 3 = pass.
Example: PRO 3 (Print if the test routine is passed).
Modes: Immediate and learn.
Errors: Syntax (Out of range, print on mode number is not 0 to 3).

PTi (Printer Terminator Is)

Function: Select printer terminator. The default number is 0.
Token: 98.
Format: PTI or PT, followed by a 1-digit number:
0 = <CR> and <LF>, 1 = <LF> only, 2 = <CR> only.
Example: PT 0 (Printer terminator to be used is <CR> and <LF>).
Modes: Immediate and learn.
Errors: Syntax (Out of range, printer terminator number is not 0 to 2).

PUrge

Function: Clear the RS-232 or GPIB buffer.
Format: PURGE or PU, alone.
Mode: Immediate only.

RD (ReaD)

Function: Request a reading. See Note (5) on page 3-1.
Format: RD followed by a 3-digit number as listed in Table 3-1.
Modes: Immediate only.

RECall

Function: Recall one of stored 2957A settings. See also under STORE.
Format: RECALL or REC, followed by a 1-digit number in the range 0 to 6.
Use: Replaces current settings by previously stored settings.
Example: REC 6 (Recall the settings in store no. 6).
Modes: Immediate only.

REPeat

Function: Repeat a loop.
Token: 87.
Format: REPEAT or REP, followed by a 3-digit number of loops in the range 0 to 255.
Use: Repeats a loop n times, each loop being terminated by NEXT.
Example: REP 2
TEST 21
NEXT (Attempt placing call to mobile twice).
Modes: Learn only.
Errors: Syntax.

RESult

Function: Argument for PRINT or WRITE, print or write result of test routine.
Token: FC.
Format: RESULT or RES, preceded by either PRINT or WRITE.
Use: PRINT sends the result to the printer port; WRITE sends the result to the screen.
Example: WR 3,9,RES (Write the result of the last test routine on the screen at column 3, row 9).
Modes: Learn only.

TABLE 3-1 READ NUMBERS

RD number	Reading
0	Out of range.
1 to 38	2955 readings. See the 2955 Programming Manual.
39	Out of range.
40 to 49	Last 1 to 10 summary lines (40 for line 1 to 49 for line 10).
50	For 2957 compatible operation only, mobile identity number.
51	For 2957 compatible operation only, equipment serial number.
52	Result field.
53	Test routine title field.
54	Test routine passed/failed field.
55	Serial poll byte as follows:- 0 = Not applicable, 1 = Not applicable, 2 = System at start of a test sequence, 3 = System paused, waiting for run/continue, 4 = Busy, system is working, 5 = System error, 6 = SRQ - Service request, 7 = RDY - Data ready, asserted with SRQ.
56	Calibration error byte as follows:- 0 = Peak error, 1 = SAT error, 2 = ST error, 3 = Infraband error, 4 = DTMF error, 5 = Data error, 6 = PSG error, 7 = Modem error.
57	Disc error byte as follows:- 0 = Successful completion, 1 = No disc inserted, 2 = Drive not ready, 3 = File locked, 4 = File deleted, 5 = Disc write protected, 6 = Disc fault, 7 = File number out of range, 8 = Disc fault default data (partial load data corrupted), 9 = Warning checksum failure, 10 = Warning different system.
58	For normal 2957A operation, GPIB error byte as follows:- 0 = No errors, 1 = Invalid command, 2 = Syntax error, 3 = Out of range. For 2957 compatible operation, enable output of summary lines.
59	For normal 2957A operation, out of range. For 2957 compatible operation, disable output of summary lines.
60 to 99	Out of range.
100 to 109	2955 readings.
>109	Out of range

RETurn

Function: Return from subroutine.
Token: 8A.
Format: RETURN or RET, alone.
Use: RETURN follows GOSUB to resume the main program sequence.
Modes: Learn only.

RPtch (RePeaT CHannel)

Function: Repeat loop from current to last voice channel.
Token: 8C.
Format: RPTCH or RP, alone.
Use: Sets up a loop between itself and the following NXTCH. Each pass of the loop causes the current voice channel number to be incremented by the handoff increment. The process ends when the last voice channel has been reached.
Example:
```
RPTCH
TEST 23
TEST 6
NXTCH  (Measure receiver distortion in the current to the last
       voice channels).
```
Modes: Learn only.

RUn

Function: Run the test sequence. See Note (4) on page 3-1.
Format: RUN or RU, alone.
Modes: Immediate only.

SAve

Function: Save the current user-defined program on disc. See Note (4) on page 3-1.
Format: SAVE or SA, followed by a 1-digit file number.
Modes: Immediate only.

SBi (number of Stop Bits Is)

Function: Set number of stop bits. The default number is 0.
Format: SBI or SB, followed by a 1-digit number: 0 = 1, 1 = 2.
Uses: Sets the RS-232 port.
Example: SB 1 (Set the RS-232 port for 2 stop bits).
Modes: Immediate only.

SCc (SAT Colour Code)

Function: Set SAT colour code. The default number is 0.
Token: DE.
Format: SCC or SC, followed by a 1-digit number:
0 = 5.97 kHz, 1 = 6.00 kHz, 2 = 6.03 kHz.
Example: SC 2 (Set the SAT to 6.03 kHz).
Modes: Immediate and learn.
Errors: Syntax (Out of range, SAT number is not 0 to 2).

Function: Read SAT colour code setting.
Format: SCC or SC, alone.
Use: To pass the SAT colour code setting to other equipment.
Modes: Immediate only.

SEqttl (SEQuence TiTLe)

Function: Set title of user-defined test sequence. The default setting is NO SEQUENCE DEFINED.
Format: SEQTTL or SE, followed by the test sequence title of up to 22 characters within quotation marks. Since the 2955 character set is used for the title, use upper case for all letters with the exception of d, k, m, s and z.
Example: SE "MYPROG" (The title of the test sequence is MYPROG).
Modes: Immediate only.

Function: Argument for PRINT or WRITE, print or write test sequence title.
Token: FA.
Format: SEQTTL or SE, preceded by either PRINT or WRITE.
Use: PRINT sends the title to the printer port; WRITE sends the title to the screen.
Example: WR 3,9,SE (Write the test sequence title on the screen at column 3, row 9).
Modes: Learn only.

SId (System ID number)

Function: Set system identity number. The default number is 03592.
Token: DF.
Format: SID or SI, followed by a 5-digit number within quotation marks.
Example: SI "36166" (Set the system identity number to 36166).
Modes: Immediate and learn.
Errors: Syntax (Invalid command).

Function: Read system identity number setting.
Format: SID or SI, alone.
Use: To pass the system identity number setting to other equipment.
Modes: Immediate only.

SRq (Service ReQuest enable/disable)

Function: Enable/disable service request. The default number is 0.
Format: SRQ or SR, followed by a single digit number: 0 = disable, 1 = enable.
Use: Enables and disables the remote service request function on the GPIB. In RS-232 control, SRQ has to be enabled.
Modes: Immediate only.

STAtus

Function: Argument for PRINT or WRITE, print or write test routine status.
Token: ED.
Format: STATUS or STA, preceded by either PRINT or WRITE.
Use: PRINT sends the status (PASSED, FAILED or ERROR) to the printer port; WRITE sends the status to the screen.
Example: WR 3,9,STA (Write the status of the last test routine on the screen at column 3, row 9.)
Modes: Learn only.

STOre

Function: Store the existing 2957A settings. See also under RECALL.
Format: STORE or STO, followed by a 1-digit number in the range 0 to 6.
Use: Makes existing settings available for future recall.
Example: STO 6 (Place existing settings in store_no. 6).
Modes: Immediate only.

STPch (STeP CHannel)

Function: Step to next voice channel.
Token: 8B.
Format: STPCH or STP, alone.
Use: Enables the current voice channel to be increased by the handoff increment without using a loop.
Modes: Learn only.

SUMmary

Function: Argument for PRINT or WRITE, print or write test routine summary.
Token: EF.
Format: SUMMARY or SUM, preceded by either PRINT or WRITE.
Use: PRINT sends the summary to the printer port; WRITE sends the summary to the screen.
Example: WR 3,9,SUM (Write the summary for the last test routine on the screen at column 3, row 9).
Modes: Learn only.

TEST

Function: Execute the following test routine.
Token: 80.
Format: TEST or TE, followed by 2-digit test routine number in the ranges 1 to 9 and 20 to 34.
Example: TE 28 (Measure transmitter power).
Modes: Learn only.
Errors: Syntax.

TITle

Function: Argument for PRINT or WRITE, print or write test routine title.
Token: FB.
Format: TITLE or TIT, preceded by either PRINT or WRITE.
Use: PRINT sends the title to the printer port; WRITE sends the title to the screen.
Example: WR 3,9,TIT (Write the test routine title on the screen at column 3, row 9).
Modes: Learn only.

TSi (Test Sequence Is)

Function: Select current test sequence.
Format: TSI or TS, followed by a 1-digit number:
0 = Brief testing, 1 = Comprehensive testing,
2 = Call processing only, 3 = Call and RF testing,
4 = User-defined.
Example: TS 4 (Select the user-defined test sequence).
Modes: Immediate only.

UPI (User Port Input)

Function: Read user port input lines.
Format: UPI alone.
Use: Reads the user port lines on the PARALLEL CONTROL PORT connector.
Modes: Immediate only.

UPO (User Port Output)

Function: Set user port output lines.
Format: UPO followed by a 3-digit number in the range 000 to 255.
Use: Sets the user port lines on the PARALLEL CONTROL PORT connector to the specified number.
Example: UPO 32 (Set the user port lines to decimal 32 (binary 00010000)).
Modes: Immediate only.

USer

Function: Enter user mode to define a test subroutine. The 2957A cannot the respond to immediate mode commands until END is received. Whenever DEF is executed, the subroutine is also executed. Each internal test sequence is thus subject to modification by the user. Before END at the end of the subroutine, RETURN causes the 2957A to resume the test sequence.
Format: USER or US, alone.
Use: Has to precede the first command in a user-defined subroutine in order to enter the learn mode.
Mode: Immediate only.

VCh (Voice CHannel)

Function: Set default current voice channel.
Token: 90.
Format: VCH or VC, followed by a 4-digit number.
Example: VC 100 (Set the default current voice channel to 100).
Modes: Immediate and learn.
Errors: Syntax (Out of range, voice channel number is not within minimum and maximum).

VMother

Function: Read the software version number of the motherboard.
Format: VMOTHER or VM, alone.
Modes: Immediate only.

VPers

Function: Read the software version number of the personality board.
Format: VPERS or VP, alone.
Mode: Immediate only.

WAit

Function: Wait for n milliseconds.
Token: 9C.
Format: WAIT or WA, followed by a 5-digit number in the range 0 to 65535.
Use: Suspends program operation for up to 65.535 seconds.
Example: WA 10000 (Suspend program operation for 10.000 seconds).
Modes: Learn only.
Errors: Syntax.

WRite

Function: Argument for WRITE, write to the 2955 screen.
Token: 84.
Formats: WRITE or WR, followed by 2-digit x and y co-ordinates and then a message within quotation marks.
WRITE or WR, followed by 2-digit x and y co-ordinates and then a command code.
Uses: Writes to the screen at row x (0 to 31), column y (0 to 39). The top left of the screen is 0,0.
Examples
1: WRITE 3,9,"WARNING" (Write WARNING on screen at column 3, row 9).
2: WRITE 3,9,RESULT (Write a measurement result on the screen at column 3, row 9).
Modes: Immediate and learn (when quotation marks are used) or learn only (when a command code is used).
Errors: Syntax.

Chapter 4

TEST ROUTINE PARAMETERS

TEST ROUTINE NO. 1 - TRANSMITTER RF POWER

Parameters 1, 2 and 3 can be selected from the following:-

Parameter	Setting	Entry	Default
1	RV & ME UL & LL	0 (xxxxxx00) or 1 (xxxxxx01)	0
2	RV or UL	10 mW to 100 W, 10 to 44 dBm, -20 to 14 dBW	3 W
3	ME	0 to 100%, 0 to 30 dB	2 dB
	ME (and RV ± ME) or LL	10 mW to 100 W, 10 to 44 dBm, -20 to 14 dBW	

TEST ROUTINE NO. 2 - TRANSMITTER RF FREQUENCY

Parameters 1, 2 and 3 can be selected from the following:-

Parameter	Setting	Entry	Default
1		a + b where	3
	RV & ME	a = 0 (xxxxxx00)	
	UL & LL	or 1 (xxxxxx01)	
	RV & ME (CC)	or 3 (xxxxxx11)	(= 3
	Cellular radio	b = 0 (0xxxxxxx)	+ 0)
	PMR	or 128 (1xxxxxxx)	
2	RV or UL (Not applicable to RV & ME (CC))	1.5 to 1000 MHz	
3	ME	0 to 100%, 0 to 1000 ppm	
	ME (and RV ± ME) or LL	0 to 1000 MHz	2.2 kHz

TEST ROUTINE NO. 3 - TRANSMITTER AF DISTORTION, TRANSMITTER SINAD, TRANSMITTER S/N AND TRANSMITTER RESIDUAL NOISE

Parameter 3 is not used so parameter 4 is entered after parameter 2. Parameters 1, 2 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1		a + b where	23
	Distortion	a = 0 (xx00xx00)	
	SINAD	or 16 (xx01xx00)	
	SINAD (Distortion)	or 19 (xx01xx11)	(= 19
	S/N	or 32 (xx10xx00)	
	Residual noise	or 48 (xx11xx00)	
	15 kHz LP filter	b = 0 (xxxx00xx)	
	0.3 to 3.4 kHz filter	or 4 (xxxx01xx)	+ 4)
	300 Hz LP filter (for noise only)	or 8 (xxxx10xx)	
2	Distortion UL	0 to 30%	
	SINAD or S/N LL	0 to 50 dB	26 dB
	Residual noise UL	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	
4	Modulation for distortion, SINAD or S/N	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	8.0 kHz

TEST ROUTINE NO. 4 - TRANSMITTER MODULATION LIMITING

Parameters 2, 3 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1			0
2	UL (maximum deviation)	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	12 kHz
3	Overload factor	0 to 30 dB	20 dB
4	Modulation (same units as parameter 2)	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	8.0 kHz

TEST ROUTINE NO. 5 - TRANSMITTER MODULATION COMPRESSION RATIO

Parameters 1, 2, 3 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1	RV & ME UL & LL	0 (xxxxxx00) or 1 (xxxxxx01)	0
2	RV or UL	0 to 10	2
3	ME ME (and RV ± ME) or LL	0 to 100% 0 to 10	10%
4	Modulation	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	2.9 kHz

TEST ROUTINE NO. 6 - RECEIVER DISTORTION, RECEIVER SINAD AND RECEIVER S/N

Parameters 1, 2, 3 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1		a + b where	31
	Distortion	a = 0 (xx00xx00)	
	SINAD	or 16 (xx01xx00)	
	SINAD (Distortion)	or 19 (xx01xx11)	(= 19
	S/N	or 32 (xx10xx00)	
	15 kHz LP filter	b = 0 (xxxx00xx)	
	0.3 to 3.4 kHz filter	or 4 (xxxx01xx)	
	Psophometric filter	or 12 (xxxx11xx)	+ 12)
2	Distortion UL	0 to 30%	
	SINAD or S/N LL	0 to 50 dB	26 dB
3	RF level	0.023 to 22 μV, -140 to -80 dBm	-80 dBm
4	Modulation	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	8.0 kHz

TEST ROUTINE NO. 7 - RECEIVER SENSITIVITY

Parameters 1, 2, 3 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1	15 kHz LP filter 0.3 to 3.4 kHz filter Psophometric filter	0 (xxxx00xx) or 4 (xxxx01xx) or 12 (xxxx11xx)	12
2	RF level UL	0.023 to 22 µV, -140 to -80 dBm	-116 dBm
3	Reference SINAD	0 to 50 dB	12 dB
4	Modulation	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	8.0 kHz

TEST ROUTINE NO. 8 - RECEIVER DEMODULATION EXPANSION RATIO

Parameters 1, 2, 3 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1	RV & ME UL & LL	0 (xxxxxx00) or 1 (xxxxxx01)	0
2	RV or UL	0 to 10	2
3	ME ME (and RV ± ME) or LL	0 to 100% 0 to 10	10%
4	Modulation	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	2.9 kHz

TEST ROUTINE NO. 9 - DC POWER CONSUMPTION

Parameters 1, 2 and 3 can be selected from the following:-

Parameter	Setting	Entry	Default
1	RV & ME UL & LL	0 (xxxxxx00) or 1 (xxxxxx01)	1
2	RV or UL	100 mW to 200 W	100 W
3	ME ME (and RV ± ME) or LL	0 to 100% 100 mW to 200 W	200 mW

TEST ROUTINE NO. 20 - REGISTRATION

Parameter 1 can be selected from the following:-

Setting	Entry	Default
RF level -80 dBm	0 (xxxxxx00)	
RF level -60 dBm	or 1 (xxxxxx01)	
RF level -40 dBm	or 2 (xxxxxx10)	2

TEST ROUTINE NO. 21 - CALL FROM CELL TO MOBILE

Parameter 1 can be selected from the following:-

Setting	Entry	Default
	a + b where	18
	a = 0 (xxx0xxxx)	
Set control port bit 3 to request mobile to answer call and reset to 0 when call is answered	or 16 (xxx1xxxx)	(= 16
RF level -80 dBm	b = 0 (xxxxxx00)	
RF level -60 dBm	or 1 (xxxxxx01)	
RF level -40 dBm	or 2 (xxxxxx10)	+ 2)

TEST ROUTINE NO. 22 - CALL FROM MOBILE TO CELL

Parameter 1 can be selected from the following:-

Setting	Entry	Default
	a + b where	18
	a = 0 (xxx0xxxx)	
Set control port bit 1 to instruct mobile to make a call and reset to 0 when call is made	or 16 (xxx1xxxx)	(= 16
RF level -80 dBm	b = 0 (xxxxxx00)	
RF level -60 dBm	or 1 (xxxxxx01)	
RF level -40 dBm	or 2 (xxxxxx10)	+ 2)

TEST ROUTINE NO. 23 - HANDOFF

Parameters 1 can be selected from the following:-

Setting	Entry	Default
No change in SAT frequency at handoff	0 (xxxxxxx0)	
Increment SCC on each handoff	or 1 (xxxxxxx1)	1

TEST ROUTINE NO. 24 - AUTOMATIC HANDOFF

Parameters 1 can be selected from the following:-

Setting	Entry	Default
No change in SAT frequency at handoff	0 (xxxxxxx0)	
Increment SCC on each handoff	or 1 (xxxxxxx1)	1

TEST ROUTINE NO. 25 - SAT TRANSPONDING

Parameters 1 and 2 can be selected from the following:-

Parameter	Setting	Entry	Default
1	Transponding only	0 (xxxxxx00)	
	Transponding and deviation	or 1 (xxxxxx01)	1
	Transponding and frequency	or 2 (xxxxxx10)	
2	Deviation or frequency ME	Value in % or Hz	20%

TEST ROUTINE NO. 26 - CLEAR DOWN FROM CELL

No parameters can be selected.

TEST ROUTINE NO. 27 - CLEAR DOWN FROM MOBILE

Parameter 1 can be selected from the following:-

Setting	Entry	Default
	0 (xxx0xxxx)	
Set control port bit 2 to request mobile to clear down and reset to 0 when call is cleared	or 16 (xxx1xxxx)	16

TEST ROUTINE NO. 28 - MOBILE RF POWER

There are different power levels and classes (assuming an antenna gain of 1.5 dB with respect to a half-wave dipole) as follows:-

Power level	Class 1	Class 2	Class 3
0	2.82 W	1.12 W	447 mW
1	1.12 W	1.12 W	447 mW
2	447 mW	447 mW	447 mW
3	178 mW	178 mW	178 mW
4	70.8 mW	70.8 mW	70.8 mW
5	28.2 mW	28.2 mW	28.2 mW
6	11.2 mW	11.2 mW	11.2 mW
7	4.47 mW	4.47 mW	4.47 mW
Station class mark	XX00	XX00	XX01

Parameters 1 to 3 can be selected from the following:-

Parameter	Setting	Entry	Default
1		a + b + c where	8
	Power level 0	a = 0 (xxxx0000)	
	Power level 1	or 1 (xxxx0001)	
	Power level 2	or 2 (xxxx0010)	
	Power level 3	or 3 (xxxx0011)	
	Power level 4	or 4 (xxxx0100)	
	Power level 5	or 5 (xxxx0101)	
	Power level 6	or 6 (xxxx0110)	
	Power level 7	or 7 (xxxx0111)	
	Test all power levels	b = 8 (xxxx1000)	
	Units: W	c = 0 (xx00xxxx)	
	Units: dBW	or 16 (xx01xxxx)	
	Units: dBm	or 32 (xx10xxxx)	
2	Upper ME	±0 to 100%, ±0 to 30 dB	2 dB
3	Lower ME	±0 to 100%, ±0 to 30 dB	-4 dB

TEST ROUTINE NO. 29 - BIT ERROR RATE

Parameters 2 and 3 can be selected from the following:-

Parameter	Setting	Entry	Default
2	LL	0 to 100%	95%
3	RF generator level	-80 to -146 dBm	-113 dBm

TEST ROUTINE NO. 30 - DTMF TONES

Parameter 1 can be selected from the following:-

Setting	Entry	Default
Disable printing of summary line and scrolling in summary display when test routine is disabled	0 (xxxxxxx0)	0
Enable printing of summary line and scrolling in summary display when test routine is disabled	or 1 (xxxxxxx1)	

TEST ROUTINE NO. 31 - HOOK FLASH

Parameter 1 can be selected from the following:-

Setting	Entry	Default
Disable printing of summary line and scrolling in summary display when test routine is disabled	0 (xxxxxxx0)	0
Enable printing of summary line and scrolling in summary display when test routine is disabled	or 1 (xxxxxxx1)	

TEST ROUTINE NO. 32 - DATA DEVIATION

This is available for user-defined test sequences.

Parameter 2 can be selected from the following:-

Setting	Entry	Default
ME	0 to 100%, 0 to 8 kHz	10%

TEST ROUTINE NO. 33 - SIGNALLING TONE DEVIATION

This is available for user-defined test sequences.

Parameter 2 can be selected from the following:-

Setting	Entry	Default
ME	0 to 100%, 0 to 8 kHz	10%

TEST ROUTINE NO. 34 - SIGNALLING TONE DURATION

This is available for user-defined test sequences.

Parameter 2 can be selected from the following:-

Setting	Entry	Default
ME	0 to 100%, 0 to 10 s	10%

Chapter 5

BUILT-IN TEST SEQUENCES

Notes...

(1) The built-in test sequences are listed below in detail to enable them to be used as programming examples. Also, sections can be abstracted and used, after modification, in user-defined test sequences.

(2) Common subroutines 0, 1, 2, 3, 25, 40, 50, 60, 95, 98 and 99 are given after the four test sequences.

CALL PROCESSING ONLY SEQUENCE

```
GOSUB 40                                Put up heading and prepare buffer
PRINT 3,1,"CALL PROCESSING ONLY"
GOSUB 50                                Perform registration and output buffer
GOSUB 60                                Do common place call from mobile
TEST 24                                 Automatic handoff
JUMP 99                                 Skip on to common exit
```

CALL AND RF TESTING SEQUENCE

```
GOSUB 40                                Put up heading and prepare buffer
PRINT 3,1,"CALL AND RF TESTING"
GOSUB 50                                Perform registration and output buffer
GOSUB 60                                Do common place call from mobile
GOSUB 1                                 Print one blank line
PRINT "HANDOFF/CHANNEL<7 SPACES>TX POWER PL 0
      <10 SPACES>TX FREQ<10 SPACES>SAT DEVIATION"
PRINT "---------------<7 SPACES>-------------
      <10 SPACES>-------<10 SPACES>-------------"
GOSUB 1                                 Print one blank line
RPTCH                                   Handoff to new channel
PRINT CLEAR                             Clear buffer
PRINT DISABLE
TEST 23                                 Handoff
JOP 30                                  Skip on if OK
PRINT ENABLE
PRINT "*** HANDOFF FAILED ***"
JUMP 99                                 Skip on to common exit
LABEL 30
PRINT 0,0,RESULT
PAR 28,1,0                              Set Tx RF power parameters
TEST 28                                 Measure Tx power level 0
PRINT 20,0,IND
PRINT 22,0,RESULT
TEST 2                                  Measure Tx RF frequency
PRINT 40,0,IND
PRINT 42,0,RESULT
TEST 25                                 Transponded SAT
```

```
PRINT 60,0,IND
PRINT 62,0,RESULT
PRINT ENABLE
PRINT LINE
NXTCH                                   Go round again for next channel
JUMP 95                                 Skip on to common exit
```

BRIEF TESTING SEQUENCE

```
GOSUB 40                                Put up heading and prepare buffer
PRINT 3,1,"BRIEF TESTING"
GOSUB 50                                Perform registration and output buffer
GOSUB 60                                Do common place call from mobile
GOSUB 1                                 Print one blank line
PRINT "<5 SPACES>TEST<15 SPACES>LOW CHANNEL
      <9 SPACES>MID CHANNEL<9 SPACES>HIGH CHANNEL"
PRINT "<5 SPACES>----<15 SPACES>-----------
      <9 SPACES>-----------<9 SPACES>------------"
GOSUB 1                                 Print one blank line
PRINT ""
PRINT DISABLE
STPCH                                   Start by handoff to first channel
TEST 23                                 Handoff from current channel
PRINT 0,0,TITLE
PRINT 23,0,RESULT
PRINT 20,0,IND
JOF 13                                  Skip on if handoff failed
JOE 13
GOSUB 25                                Transponded SAT deviation
PRINT 0,1,TITLE
PRINT 23,1,RESULT
PRINT 20,1,IND
TEST 25                                 Measure SAT frequency
PRINT 0,2,TITLE
PRINT 23,2,RESULT
PRINT 20,2,IND
PRINT 0,3,"TX POWERS"
TEST 28                                 Measure Tx RF power
JOP 10
PRINT 14,3,TITLE
PRINT 14,3,"<6 SPACES>F "
PRINT 28,3,RESULT
JUMP 11
LABEL 10
PRINT 23,3,"ALL PASSED"
LABEL 11
TEST 2                                  Measure Tx RF frequency
PRINT 0,4,TITLE
PRINT 23,4,RESULT
PRINT 20,4,IND
TEST 3                                  Measure Tx AF noise
PRINT 0,5,TITLE
PRINT 23,5,RESULT
PRINT 20,5,IND
TEST 4                                  Measure Tx modulation limiting
PRINT 0,6,TITLE
```

```
PRINT 23,6,RESULT
PRINT 20,6,IND
TEST 6                                  Measure Rx distortion
PRINT 0,8,TITLE
PRINT 23,8,RESULT
PRINT 20,8,IND
TEST 7                                  Measure Rx sensitivity
PRINT 0,9,TITLE
PRINT 23,9,RESULT
PRINT 20,9,IND
LABEL 13
NXTCH                                   Go round again for next channel
TEST 23                                 Handoff
PRINT 43,0,RESULT
PRINT 40,0,IND
JOF 17
JOE 17
GOSUB 25                                Transponded SAT deviation
PRINT 43,1,RESULT
PRINT 40,1,IND
TEST 25                                 Transponded SAT frequency
PRINT 43,2,RESULT
PRINT 40,2,IND
TEST 28                                 Measure Tx RF power
JOP 14
PRINT 34,3,TITLE
PRINT 34,3,"<6 SPACES>F "
PRINT 48,3,RESULT
JUMP 15
LABEL 14
PRINT 43,3,"ALL PASSED"
LABEL 15
TEST 2                                  Measure Tx RF frequency
PRINT 43,4,RESULT
PRINT 40,4,IND
TEST 3                                  Measure Tx noise
PRINT 43,5,RESULT
PRINT 40,5,IND
TEST 4                                  Measure Tx modulation limiting
PRINT 43,6,RESULT
PRINT 40,6,IND
TEST 6                                  Measure Rx distortion
PRINT 43,8,RESULT
PRINT 40,8,IND
TEST 7                                  Measure Rx sensitivity
PRINT 43,9,RESULT
PRINT 40,9,IND
LABEL 17
NXTCH                                   Go round again for next channel
TEST 23                                 Handoff from current channel
PRINT 63,0,RESULT
PRINT 60,0,IND
JOF 21
JOE 21
GOSUB 25                                Transponded SAT
PRINT 63,1,RESULT
PRINT 60,1,IND
```

```
TEST 25                                  Measure SAT frequency
PRINT 63,2,RESULT
PRINT 60,2,IND
TEST 28                                  Measure Tx RF power
JOP 18
PRINT 54,3,TITLE
PRINT 54,3,"<6 SPACES>F "
PRINT 68,3,RESULT
PRINT 78,3,""
JUMP 19
LABEL 18
PRINT 63,3"ALL PASSED"
LABEL 19
TEST 2                                   Measure Tx RF frequency
PRINT 63,4,RESULT
PRINT 60,4,IND
TEST 3                                   Measure Tx AF distortion
PRINT 63,5,RESULT
PRINT 60,5,IND
TEST 4                                   Measure Tx modulation limiting
PRINT 63,6,RESULT
PRINT 60,6,IND
TEST 6                                   Measure Rx distortion
PRINT 63,8,RESULT
PRINT 60,8,IND
TEST 7                                   Measure Rx sensitivity
PRINT 63,9,RESULT
PRINT 60,9,IND
LABEL 21
PRINT ENABLE                             Print results
PRINT BUFFER
JUMP,95                                  Skip on to common exit
```

COMPREHENSIVE TESTING SEQUENCE

```
GOSUB 40                          Put up heading and prepare buffer
PRINT 3,1,"COMPREHENSIVE TESTING"
GOSUB 50                          Perform registration and output buffer
GOSUB 60                          Do common place call from mobile
TEST 29                           Bit error rate (tested once only)
RPTCH                             Handoff to new channel (for testing on
                                  all channels required)

PRINT CLEAR
GOSUB 1                           Print one blank line
PRINT " NEW VOICE CHANNEL"
PRINT " -----------------"
TEST 23                           Handoff from current channel
JOF 99                            If failed skip on to end
JOE 99                            If error skip on to end
TEST 25                           Transponded SAT deviation
GOSUB 25                          SAT frequency
PAR 28,1,7                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 7
TEST 9                            Measure DC power level 7
PAR 28,1,6                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 6
TEST 9                            Measure DC power level 6
PAR 28,1,5                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 5
TEST 9                            Measure Dc power level 5
PAR 28,1,4                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 4
TEST 9                            Measure DC power level 4
PAR 28,1,3                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 3
TEST 9                            Measure DC power level 3
PAR 28,1,2                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 2
TEST 9                            Measure DC power level 2
PAR 28,1,1                        Set Tx  RF power parameters
TEST 28                           Measure Tx power level 1
TEST 9                            Measure DC power level 1
PAR 28,1,0                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 0
TEST 9                            Measure DC power level 0
TEST 2                            Measure Tx RF frequency
PAR 3,1,23,26dB                   Set Tx distortion parameters
TEST 3                            Measure Tx noise
PAR 3,1,56,300Hz                  Measure Tx residual noise
TEST 3                            Measure Tx noise
TEST 4                            Measure Tx modulation limiting
TEST 5                            Measure Tx compression
TEST 6                            Measure Rx distortion
TEST 7                            Measure Rx sensitivity
TEST 8                            Measure Rx expansion
NXTCH                             Go round again for next channel
GOSUB 2                           Print two blank lines
TEST 26                           Clear from cell
TEST 9                            Measure quiescent DC power
JUMP 98                           Skip on the common exit
```

COMMON SUBROUTINES

Subroutines 0 to 3

```
LABEL 3                                 Print three blank lines
PRINT ""
LABEL 2                                 Print two blank lines
PRINT ""
LABEL 1                                 Print one blank line
PRINT ""
LABEL 0
RETURN
```

Subroutine 25

```
LABEL 25
PAR 25,1,1,20%                          Set SAT deviation parameters
TEST 25                                 Transponded SAT deviation
PAR 25,1,2,10 Hz                        Set SAT frequency parameters
RETURN
```

Subroutine 40

```
LABEL 40                                Heading and prepare buffer
PRINT "MARCONI INSTRUMENTS AMPS CELLULAR RADIO TEST SYSTEM"
PRINT "--------------------------------------------------"
GOSUB 1                                 Print one blank line
DEF                                     Default parameters
PRINT CLEAR
RETURN
```

Subroutine 50

```
LABEL 50                                Registration
PRINT DISABLE
TEST 20                                 Registration of mobile
PRINT 2,7,"DATE:............."
PRINT 40,7,"TESTER:............."
JOP 51
PRINT 3,4,"*** REGISTRATION FAILED ***"
JUMP 52
LABEL 51
PRINT 3,3,"ESN:"
PRINT 8,3,ESN
PRINT 3,5,"MIN:"
PRINT 8,5,MIN
LABEL 52
PRINT ENABLE
PRINT BUFFER
PRINT CLEAR
RETURN
```

Subroutine 60

```
LABEL 60                                Common place call from mobile tests
STPCH                                   Start on first traffic channel
REPEAT 2                                Make two attempts
```

```
TEST 22                                 Place call from mobile
JOP 61                                  Skip on if passed
NEXT
PRINT "***SOME TESTS ABORTED***"
JUMP 62                                 Miss next test if failed
LABEL 61                                Continue tests requiring user
                                        intervention
TEST 30                                 DTMF test
TEST 31                                 Hook flash test
TEST 27                                 Clear from mobile
LABEL 62                                Call mobile
REPEAT 2                                Make two attempts
TEST 21                                 Call from cell to mobile
JOP 0                                   If passed, skip on
NEXT                                    Else try again
RETURN
```

Subroutine 95

```
GOSUB 1                                 Print one blank line
PRINT CLEAR                             Clear text buffer
PRINT 40,0,"F = FAILURE, E = ERROR"
PRINT LINE
```

Subroutine 99

```
LABEL 99                                Common exit point
GOSUB 2                                 Print two blank lines
TEST 26                                 Clear from MTX
```

Subroutine 98

```
LABEL 98
GOSUB 3                                 Print three blank lines
PRINT CLEAR                             Clear text buffer
PRINT 25,0,"TEST SUMMARY:"
PRINT 39,0,SUM
PRINT LINE
PRINT "<FF>"                            Print a form feed (0C hexadecimal)
END
```

Chapter 6

SAMPLE PROGRAMS

USING A GPIB CONTROLLER

To use a typical controller for a user-defined test sequence with redefined test routine parameters, a sample program is given below. The 2957A has to be in the remote CRTS mode.

```
SEQTTL 'USER DEFINED EXAMPLE'          Define test sequence title
LEARN                                  Enter learn mode to define sequence
GOSUB 40                               Put up heading and clear buffer
PRINT 3,1,'CALL PROCESSING ONLY'
GOSUB 50                               Do registration and output buffer
GOSUB 60                               Do common place call from mobile
TEST 24                                Automatic handoff
JUMP 99                                Then skip to common exit
LABEL 40                               Put up heading/clear buffer routine
PRINT 'MARCONI INSTRUMENTS AMPS CELLULAR RADIO TEST SYSTEM'
PRINT '------------------------------------------------'
PRINT''                                Blank line
DEF                                    Set default parameters
PRINT CLEAR RETURN                     Clear buffer then return
LABEL 50                               Do registration and output buffer
PRINT DISABLE                          Disable printer
TEST 20                                Perform registration
PRINT 2,7,'DATE:.............'
PRINT 40,7,'TESTER:.............'
JOP 51                                 Skip on if passed
PRINT 3,4,'*** REGISTRATION FAILED ***'
JUMP 52                                Failed, so skip ESN print routine
LABEL 51                               ESN and MIN print routine
PRINT 3,3,'ESN:'
PRINT 8,3,ESN
PRINT 3,5,'MIN:'
PRINT 8,5,MIN
LABEL 52                               Print buffer routine
PRINT ENABLE PRINT BUFFER RETURN       Enable and print buffer then return
LABEL 60                               Do common place call from mobile
VCH 300                                Start at centre frequency
REPEAT 2                               Make two attempts
TEST 22                                Place call from mobile
JOP 61                                 Skip on if passed
NEXT                                   Else try again
PRINT '*** CLEAR FROM MS ABORTED ***'
JUMP 62                                Miss next test if failed
LABEL 61
TEST 30                                Perform DTMF
TEST 31                                Perform hook flash
TEST 27                                Clear from mobile
LABEL 62                               Call mobile
REPEAT 2                               Make two attempts
TEST 21                                Call from cell
JOP 63                                 Skip on if passed
```

```
NEXT                                    Else try again
LABEL 63 RETURN
LABEL 99                                Common exit point
PRINT CLEAR PRINT LINE PRINT LINE       Two blank lines
TEST 26                                 Clear from cell
LABEL 98
PRINT LINE PRINT LINE PRINT LINE        Three blank lines
PRINT 25,0,'TEST SUMMARY:'
PRINT 39,0,SUMMARY PRINT LINE
PRINT '<FF>'                            Print a form feed (use CHR$ in BASIC)
END                                     End of test sequence
```

USING A PERSONAL COMPUTER

A test program can be created as a text file using a personal computer. The program is then transferred to the 2957A in learn mode using the GPIB or the RS-232 port. Once in memory or saved on disc, the computer can be disconnected and the test can be subsequently run on the 2957A whenever it is required.

A sample program for a user-defined test sequence is given below. This is for a PC connected to the GPIB and using GPIB address 06 for the 2957A.

When the program is subsequently RUN, the test sequence puts the mobile into CONVERSATION mode and then proceeds to execute four receiver tests on the mobile using a redefined set of limits.

```
10   ! **RX TESTING**
20   !
30   DIM A$[100]                        Set maximum length of command A$
40   REMOTE 706                         Put 2957A into GPIB remote mode
50   READ A$                            Read the DATA command
60   OUTPUT 706 USING "K";A$            Send the command to the 2957A
70   IF A$ <> "END" THEN GOTO 50        If A$ isn't END, go to line 40
80   GOTO 230                           If it is, go to end of program
90   DATA TSI 4                         Select user-defined test sequence
100  DATA "SEQTTL 'RECEIVER TESTING'"   Set the sequence title
110  DATA LEARN                         Put 2957A into learn mode
120  DATA TEST 20                       Registration on control channel
130  DATA TEST 21                       Call cell to mobile
140  DATA PAR 7,2,-115dBm,,5.7kHz       Set TEST 7 parameters
150  DATA TEST 7                        Measure Rx sensitivity
160  DATA PAR 6,1,12,5%,-107dBm         Set TEST 6 parameters
170  DATA TEST 6                        Measure Rx distortion
180  DATA PAR 6,1,36,,-80dBm,5.7kHz     Redefine TEST 6 parameters
190  DATA TEST 6                        Measure Rx distortion
200  DATA PAR 8,3,3%                    Set TEST 8 parameters
210  DATA TEST 8                        Measure Rx expansion
220  DATA END                           End of learn mode
230  END                                End of program
```

APPENDIX 1 COMMAND CODES

Command code	Function	Token	Syntax form	Data format	Modes
BRi	Set baud rate for RS-232 port	96	2	1 digit	I & L
BUffer	Print printer array buffer	E3	4	-	L
CCH	Set current control channel	8F	2	4 digits	I & L
CCi	Set default control channel	8E	2	4 digits	I & L
CLear	Clear printer array buffer	E2	4	-	L
COMmand	Control 2955 directly in CRTS mode	9B	7	Text	I & L
CONtinue	Continue after pause	-	1	-	I
CRTS	Change to CRTS mode	-	1	-	I
CSl	Enable/disable continuous summary lines	-	2	1 digit	I
DCc	Set digital colour code	DD	2	1 digit	I & L
	Read digital colour code	-	1	-	I
DEfault	Load default parameter data, execute any user-defined subroutine	82	1	-	I & L
DFi	Set display format	94	2	1 digit	I & L
DIsable	Disable printing	E0	4	-	L
DSi	Set disc step rate	-	2	1 digit	I
DTmf	Enable/disable DTMF test	DB	2	1 digit	I & L
	Read DTMF test setting	-	1	-	I
ECho	Enable/disable RS-232 echo	-	2	1 digit	I
ENAble	Enable printing	E1	4	-	L
END	End of program or user-defined subroutine, return to immediate mode	FF	1	-	L
ESn	Read equipment serial number	-	1	-	I
	Print or write ESN	F1	4	-	L
Fvc	Set first voice channel	91	2	4 digits	I & L
Gosub	Call subroutine at given label	89	2	3 digits	L
HF	Enable/disable hook flash test	DA	2	1 digit	I & L
	Read hook flash test setting	-	1	-	I
HInc	Set handoff increment	93	2	4 digits	I & L
Indicator	Print or write test status indicator	EE	4	-	L
JBC	Jump to label if designated bit is clear	A4	5	1 & 3 digits	L
JBS	Jump to label if designated bit is set	A5	5	1 & 3 digits	L
JEq	Jump to label if value is equal to flag register	A6	5	3 & 3 digits	L
JNe	Jump to label if value is not equal to flag register	A7	5	3 & 3 digits	L

Command code	Function	Token	Syntax form	Data format	Modes
JOE	Jump to label on test error	A2	2	3 digits	L
JOF	Jump to label on test failure	A3	2	3 digits	L
JOP	Jump to label on test pass	A1	2	3 digits	L
JUmp	Jump to label unconditionally	86	2	3 digits	L
Key	Wait for keypress and store value in flag register	9A	1	-	L
LAbel	Marker for position in program	85	2	3 digits	L
LEarn	Enter learn mode	-	1	-	I
LIne	Print first line of printer array buffer	E4	4	-	L
LOAd	Load a file from disc	-	2	1 digit	I
LOCal	Go to local control mode from RS-232	-	1	-	I
LPi	Set data length and parity of serial port	-	2	1 digit	I
LVc	Set last voice channel	92	2	4 digits	I & L
Min	Set mobile identity number	-	6	Number	I
	Read MIN	-	1	-	I
	Print or write MIN	F0	4	-	L
NExt	Next pass of repeat loop	88	1	-	L
NFI	Set number format	D9	2	1 digit	I & L
	Read number format setting	-	1	-	I
NOrmal	Go to normal 2955 mode	-	1	-	I
NXtch	Next channel and next RPTCH loop	8D	1	-	L
PARameter	Set test routine parameters	81	3	2 & 1 digits & text	L
PAUse	Pause at end of current test routine	-	1	-	I
PEI	Peek I/O address and place contents in flag register	9D	2	3 digits	I & L
PEM	Peek memory address and place contents in flag register	9E	2	5 digits	I & L
PMi	Set pause mode	95	2	1 digit	I & L
POI	Poke I/O port with data	9F	5	3 & 3 digits	I & L
POM	Poke memory with data	A0	5	5 & 3 digits	I & L
PPi	Select printer port	97	2	1 digit	I & L
PRInt	Print to current printer port	83	4	2 & 2 digots & text/code	I & L
PRO	Set criteria for printing result of test routine	99	2	1 digit	I & L
PTi	Select printer terminator	98	2	1 digit	I & L
PUrge	Clear RS-232 or GPIB buffer	-	1	-	I
RD	Request a reading	-	2	3 digits	I
RECall	Recall settings	-	2	1 digit	I
REPeat	Repeat a loop	87	2	3 digits	L
RESult	Print or write test routine result	FC	4	-	L
RETurn	Return from subroutine	8A	1	-	L
RPtch	Repeat loop from current to last voice channel	8C	1	-	L

Command code	Function	Token	Syntax form	Data format	Modes
RUn	Run test sequence	-	1	-	I
SAve	Save current user-defined program on disc	-	2	1 digit	I
SBi	Set number of stop bits	-	2	1 digit	I
SCc	Set SAT colour code	DE	2	1 digit	I & L
	Read SAT colour code setting	-	1	-	I
SEqttl	Set title of user-defined test sequence	-	6	Text	I
	Print or write test sequence title	FA	4	-	L
SId	Set system identity number	DF	6	5 digits	I & L
	Read system identity number	-	1	-	I
SRq	Enable/disable service request	-	2	1 digit	I
STAtus	Print or write test routine status	ED	4	-	L
STOre	Store setting	-	2	1 digit	I
STPch	Step to next voice channel	8B	1	-	L
SUMmary	Print or write test routine summary	EF	4	-	L
TEst	Execute following test routine	80	2	2 digits	L
TITle	Print or write current test routine title	FB	4	-	L
TSi	Select test sequence	-	2	1 digit	I
UPI	Read user port input lines	-	1	-	I
UPO	Set user port output lines	-	2	3 digits	I
USer	Enter user mode	-	1	-	I
VCh	Set current voice channel	90	2	4 digits	I & L
VMother	Read version of motherboard software	-	1	-	I
VPers	Read version of personality board software	-	1	-	I
WAit	Wait for n milliseconds	9C	2	5 digits	L
WRite	Write to 2955 screen at x, y	84	4	2 & 2 digits & text/write	I & L

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